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Outline and Bibliography
for the 4-Week Q-7 Coding Course

100 Mar 1964

TECHNICAL MEMORANDUM

(TM Series)

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Outline and Bibliography
for the 4-Week Q-7 Coding Course

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20 March 1963

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OUTLINE

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| 2. Arithmetic Element | 1K |
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| 4. Control Element (inst, program) | 1R, 1Y |

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- | | |
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 - 2. Entrance Parameters, Exit Parameters, Statement Variable
 - 3. Saving Index Registers
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 - 1. MUL, TMU
 - 2. Scaling 4C
 - K. DIVISION
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BIBLIOGRAPHY

Ref. 1 FN-1567, A Guide to AN/FSQ-7 Computer Instructions

A.	p. 11	Logical Elements
B.	p. 13	Dual Arithmetic
C.	p. 5-10	The SAGE Computer
D.	p. 15-18	Machine Language
E.	p. 18-20	Machine Timing
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Ref. 2 SD-3216, Programming Data for the AN/FSQ-7, 8

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B.	p. 56	Sequence of Instruction Execution
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J.	p. 67	Test Memory
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Ref. 3 FN-6179 and supplements, Coseal Utility System for the Q-7

- A. p. 93-159 Program Assembler
- B. p. 23-32 Control Cards
- C. p. 41-53 General Input
- D. p. 54-73 General Output
- E. p. 82-91 Tape and Card Formats
- F. p. 244-252 Tape File Maintenance
- G. p. 252-256 Eggleston Tape Compare
- H. p. 310-325 Symbolic Corrector
- J. p. 325-328 Memory Print
- K. p. 328-339 I T & T
- L. p. 339-344 Load Coseal

Ref. 4 N-11132, Scaling

- A. p. 4 Maximum precision
- B. p. 5-6 Addition and Subtraction
- C. p. 7-10 Multiplication
- D. p. 10-13 Division

Ref. 5 FN-5266 Indexing and Looping

Ref. 6 N-16410 Coseal Reference Sheets

Ref. 7 N-17813/000/00 Sample Coseal Printout

Ref. 8 N-11556, S1 Q-7 Idiosyncrasies

Ref. 9 FN-5127 Drum System

Ref. 10 FN-5726 Tape Programming for the Q-7

Ref. 11 N-(L)-11893 Tape Instruction Chart - Q-7

Ref. 12 FN-5128 Test Memory and I/O Units

- A. p. 1-10 Test Memory
- B. p. 11-19 I/O Units

Ref. 13 FN-LS-5394/069/00 91W Compool Table and Item Dictionary

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